



**Metropolitan Transportation Commission**

# **Technology Transfer Seminar**

## **“Traffic Calming – A Comprehensive Approach”**

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# Seminar Agenda

- Introduction
- Traffic Calming – A Comprehensive Approach
- Legal Issues and Traffic Calming
- Local Experience
  - Case study: Canary Drive Stages I and II Traffic Calming
  - San Jose's *Smart Streets* Education & Awareness Program

# Traffic Calming – A Comprehensive Approach

- Introduction
  - Definition, Objectives, and Challenges
  - Authority to “Calm Streets”
  - State of the Practice
  - Levels of Traffic Calming
  - A Comprehensive Approach
- Traffic Calming Tools
- Advantages and Disadvantages
  - Summary
  - Volume, Speed, and Safety Impacts
  - Emergency Response
- Processes and Programs

# Introduction

# What is “Traffic Calming”?

- Numerous Definitions
- Different in Each Community

... a way to Address:

**“too many cars, going too fast,  
past my house”**

# Objectives of Traffic Calming

- Reduce Speeds
- Reduce Cut-Through traffic
- Increase Safety:
  - Pedestrians
  - Bicycles
  - Vehicles
- Improve Quality of Life
- Do not “shift” the problem

# Challenges

- Perception of the problem
  - Who is “cutting-through”?
  - What speed is too high?
- US vs. THEM
- Shifting the problem
- Emergency Vehicle Access/Response
- Costs/Resources
- Potential for Proliferation
- Legal Issues

# Authority to “Calm Streets”

- Traffic Calming Tools —→ **Design Features**



# Authority to “Calm Streets”

- MUTCD
  - Governs traffic control devices
  - Does not prohibit traffic calming features
  - No standards for “calming”
  - Adopted speed hump markings
  - Adopted speed hump sign
  - Adopted circular intersection sign

# State of the Practice

- Institute of Transportation Engineers
  - Traffic Calming State of the Practice (August 1999)
  - Guidelines for the Design and Application of Speed Humps (June 1997)
  - Traditional Neighborhood Development Street Design Guidelines (October 1999)
- Many States
- Many California Communities
  - Streets and Sidewalks, People and Cars: The Citizen's Guide to Traffic Calming

# A Comprehensive Approach

- Engineering
- Enforcement
- Education
- Public Involvement

# Traffic Calming Tools

# Level 1 → Level 3

- Less Impacting
  - Less Restrictive
  - Lower Cost
- More Secondary Impacts
  - More Restrictive
  - Higher Cost

# Level One

- Least restrictive tools
- Easiest to implement
- Less potential to shift problem
- Less effect on emergency
- Lower cost
- Faster to implement
- Lower controversy
- **Examples: enhanced enforcement, speed monitoring trailer, neighborhood traffic watch**

## Level Two

- Moderately restrictive tools
- Greater effect on emergency response
- Greater potential to shift problems
- Higher cost
- More complex approval process
- **Examples: crosswalk warning system, chokers, turn restrictions via signage**

# Level Three

- Most restrictive tools
- Strong potential to affect emergency response
- Strong potential to shift problems
- Generally the highest cost
- Should be considered only after Level One and Two tools have been reviewed and/or tested in the field
- **Examples: speed humps, traffic circles, street closures**



# Level One

# Enhanced Police Enforcement

## Advantages:

- **Effective while officer is present and monitoring speeds**
- Can be implemented in almost any location at short notice

## Disadvantages:

- **Not self enforcing; temporary measure**
- Fines may not cover cost of enforcement
- Short “memory effect” when enforcement officer no longer present

## Special Considerations:

- Often helpful in school zones
- May be used during “learning period” when new devices or restrictions first implemented

## Cost:

- High cost primarily due to the staffing requirements

## Where to Apply:

- *All residential streets where speeding is a concern*

# Speed Monitoring Trailer

## Description:

- Mobile trailer mounted radar display that informs drivers of their speed. Also collects speed data.

## Advantages:

- **Effective speed control while in use**
- **Educates drivers on speeds**



## Disadvantages:

- Duration of effectiveness limited – some residual effects noted
- Not self enforcing in long run

## Cost:

- Low to moderate cost due purchase price and to staffing requirements

## Where to Apply:

- *Any local/residential street where speeding is a problem*

# Neighborhood Traffic Watch

## Description:

- Residents volunteer to observe violations and are trained to use radar units to record and report habitual speeds. Courtesy letters may be sent by police

## Advantages:

- **Involves affected residents. Effective educational tool**
- May have longer term effects as neighbors become aware of who is speeding and the concerns of others neighbors

## Disadvantages:

- Requires extensive volunteer citizen involvement
- May need to consider legal issues

## Cost:

- Low to Moderate

## Where to Apply:

- *Residential streets with speeding concerns and willing, active neighbors*

# Speed Photo Enforcement Unit

## Description:

- Similar to radar speed trailer, except the unit actually takes photos of speeders, and tickets are issued via mail. Unit is mobile and is moved from location to location

## Advantages:

- Very effective for speed reduction while in use

## Disadvantages:

- Cost of unit is very high
- Perceived “Big Brother” element may create controversy over use
- **Not currently allowed in California**

## Cost:

- High

## Where to Apply:

- *Any street where speeding is a concern*

# Higher Visibility Crosswalk

## Description:

- Higher visibility cross walk design using either special signing and striping or special paving treatment

## Advantages:

- **More visible to drivers than traditional crosswalks, greater awareness**

## Disadvantages:

- Pedestrians may place too high a level of reliance on the ability of the crosswalk to control drive behavior
- Higher maintenance than standard crosswalk

## Cost:

- Low

## Where to Apply:

- *Use at uncontrolled crosswalks as determined appropriate by City Traffic Engineer*

# Pedestrian Crossing Signs

## Description:

- Signs placed in the roadway median at marked crosswalks that advise motorists of the pedestrian right-of-way

## Advantages:

- **Brings motorists attention to crosswalk and pedestrian activity**
- May result in slower speed at the crosswalks

## Disadvantages:

- **Driver confusion**
- Proliferation of such signs would tend to diminish effectiveness

## Cost:

- Low

## Where to Apply:

- *Selected crosswalk locations with high levels of pedestrian activity.*
- *May be applied in combination with other special crosswalk treatments such as special pavement or raised crosswalk*

# Level Two



# Crosswalk Warning System

## Description:

- Lights embedded in the pavement at a pedestrian crossing which flash to alert on-coming motorists when a pedestrian is crossing

## Advantages:

- **Much higher visibility to drivers than standard crosswalk**
- Visible at night and during haze and fog conditions
- Provides additional visibility for slower pedestrians

## Special Considerations:

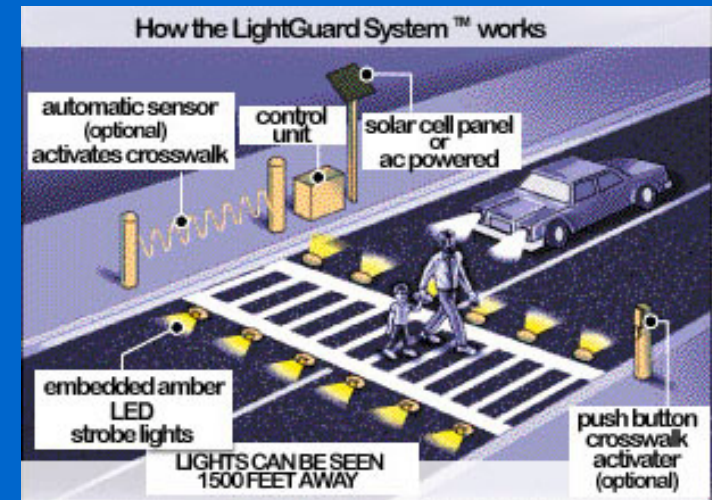
- 200 installed nation wide, but still a “new” measure
- Higher maintenance than standard crosswalks

## Cost:

- High – up to \$20,000 per application

## Where to Apply:

- *Limited to special locations to be determined by City Traffic Engineer*



# Entry Island (Neighborhood Identification Island)

## Description:

- A raised island in the center of a two-way street that identifies the entrance to a neighborhood

## Advantages:

- Notifies motorist of change in roadway character
- Helps slow traffic
- Opportunity for landscaping and/or neighborhood entry signage for aesthetic improvements
- May discourage some cut-through traffic

## Disadvantages:

- Need for maintenance (and irrigation)
- May necessitate removal of parking
- **Limited effectiveness on speed or volume control**

## Cost:

- Medium to high cost to install, landscape and maintain

## Where to Apply:

- *In the entry to a residential area where street is wide enough and speeding and/or cut-through traffic is a concern*

# Raised Crosswalk

## Description:

- Flat-topped speed hump built as a pedestrian crossing. They are usually lower than speed humps

## Advantages:

- Slows traffic
- **Increases pedestrian visibility in the crosswalk**
- Clearly designates the crosswalks

## Disadvantages:

- Increases emergency response times
- May damage emergency response vehicles if not carefully designed
- May increase traffic noise in vicinity of crosswalk
- May create drainage issues where raised crossing extends from curb to curb

## Special Considerations:

- Appropriate near schools, recreation facilities, other areas with high pedestrian activity
- Should not be used on critical emergency response routes
- Needs to be used in conjunction with other traffic calming devices to control speeds

## Cost:

- Moderate

## Where to Apply:

- *Local streets where speed control and pedestrian crossing designation are desired*
- *Local streets where cut-through traffic is to be discouraged*

# Mid-Block Narrowing

## Description:

- Segments of roadway narrowing where curbs are extended toward the center of the roadway

## Advantages:

- Pedestrian visibility increased and crossing distance reduced
- **May contribute to vehicular speed reduction**

## Disadvantages:

- Creates drainage issues where curb and gutter exist
- May create a hazard for bicyclists

## Cost:

- Medium to high cost depending on landscaping, pavement treatments and storm drainage considerations

## Where to Apply:

- *Mid-block locations on local residential or collector streets where speeding and/or cut-through traffic is a concern*

# Chokers at Intersections

## Description:

- Raised islands built to narrow the roadway at intersections.

## Advantages:

- Pedestrian crossing distance reduced
- **Narrowed roadway section may contribute to vehicular speed reduction**
- Creates neighborhood “gateway”

## Disadvantages:

- May create hazard for bicyclists who are less visible to cross street and turning traffic

## Cost:

- Moderate to high

## Where to Apply:

- *Typically used adjacent to intersections on local residential or collector streets where speeding and/or cut-through traffic is a concern*

# Lane Reduction/Lane Narrowing

## Description:

- Modify roadway striping to either narrow lanes or reduce the number of lanes

## Advantages:

- **May reduce speeds due to perceived narrower roadway space by motorist**

## Disadvantages:

- Speed reduction less effective than other more restrictive measures
- May require some parking removal
- May result in shifting volumes to adjacent streets

## Cost:

- Low to Moderate

## Where to Apply:

- *Wide residential streets where speed control is desired*

# Stop Sign as Neighborhood Traffic Control Measure

## Description:

- **Stop signs are a traffic control device used to assign the right-of-way at intersections.** Although not intended for this purpose, stop signs have been used in many communities as a measure to discourage cut-through traffic
- **One of the most requested “tools” by residents, elected officials**

## Advantages:

- Placement of additional stop signs may discourage some cut-through traffic
- Easy to implement low cost measure which may be perceived by affected residents as a positive step toward solving the problem

## Disadvantages:

- Not approved by most professional traffic engineers for neighborhood traffic management purposes
- Proliferation of stop signs may result in motorists dis-obeying the signs
- Could result in increase in speeds between the signs as drivers try to “make up for lost time”
- May increase vehicle noise at new stop sign location
- May increase traffic congestion as vehicles stop at multiple signs

## Cost:

- Low

## Where to Apply:

- *Stop signs intended for intersections where right-of-way is confusing*
- *Has been applied as a neighborhood control measure where speeding and/or cut through traffic is an issue*
- *Must be carefully reviewed by City Traffic Engineer for safety and other issues*

# Turn Restrictions/Physical Barrier

## Description:

- Regulatory signing which prohibits certain movements – may be all day or time restricted

## Advantages:

- **Effective volume reduction where used properly**
- May reduce “speeders” who cut through

## Disadvantages:

- Requires enforcement
- Increases movements at other locations

## Cost:

- Low to Moderate

## Where to Apply:

- *Periphery of residential neighborhoods*



# Level Three

# Speed Hump

## Description:

- Speed humps are areas of pavement raised approximately 3 inches in varying widths. They are designed to result in a gradual speed reduction to near 25 mph. They should be marked with signs and pavement markings.

## Advantages:

- Effectively slows traffic to near 25 mph speed limit
- Self enforcing
- May reduce volume by discouraging non-resident traffic

## Disadvantages:

- Increases emergency response times. May damage emergency response vehicles if not carefully designed
- Increases traffic noise in vicinity of hump
- Aesthetics – some residents may perceive them to be unattractive
- May result in shifting volumes to a parallel residential street
- Can create hazards for bicyclists, motorcycles and pedestrians

## Special Considerations:

- Should not be used on critical emergency response routes
- Needs to be used in series or in conjunction with other traffic calming devices to control speeds

## Cost:

- Moderate to high, depending on number to be installed

## Where to Apply:

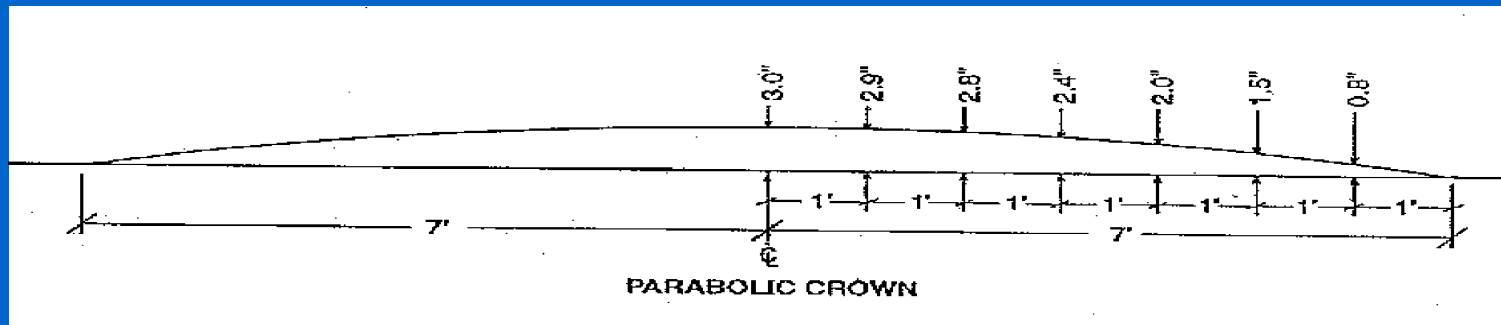
- *Local residential streets with 25 mph speed limit with no more than one lane in each direction*
- *Local residential streets with daily traffic not less than 500 vehicles and not exceeding approximately 3,00 to 5,000 vehicles per day*
- *Must have demonstrated speeding problem (85<sup>th</sup> percentile speed exceeding 32 mph)*
- *Not on critical emergency response routes or transit routes*
- *Not on streets with grades which exceed 5%*

# Speed Humps



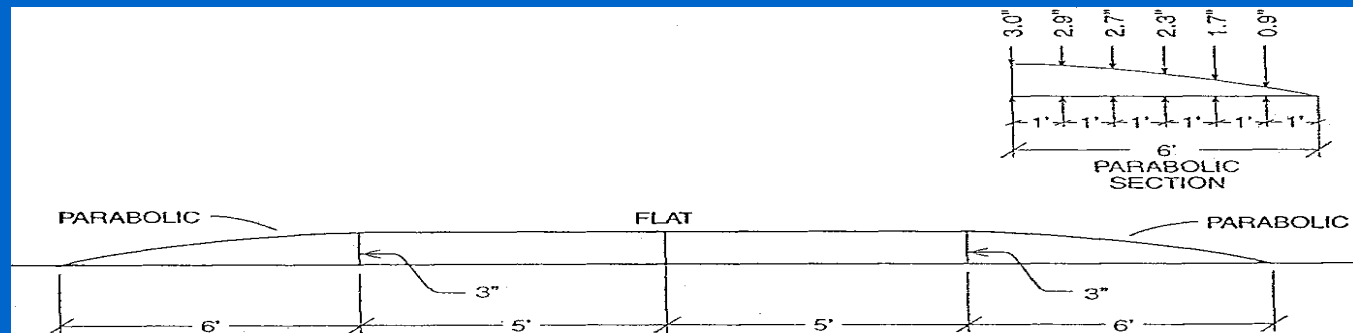
# Sample Speed Hump Profiles

## 14' Speed Hump



Source: Bureau of Traffic Management, "Traffic Manual" Portland, OR, December 1994, Chapter 11

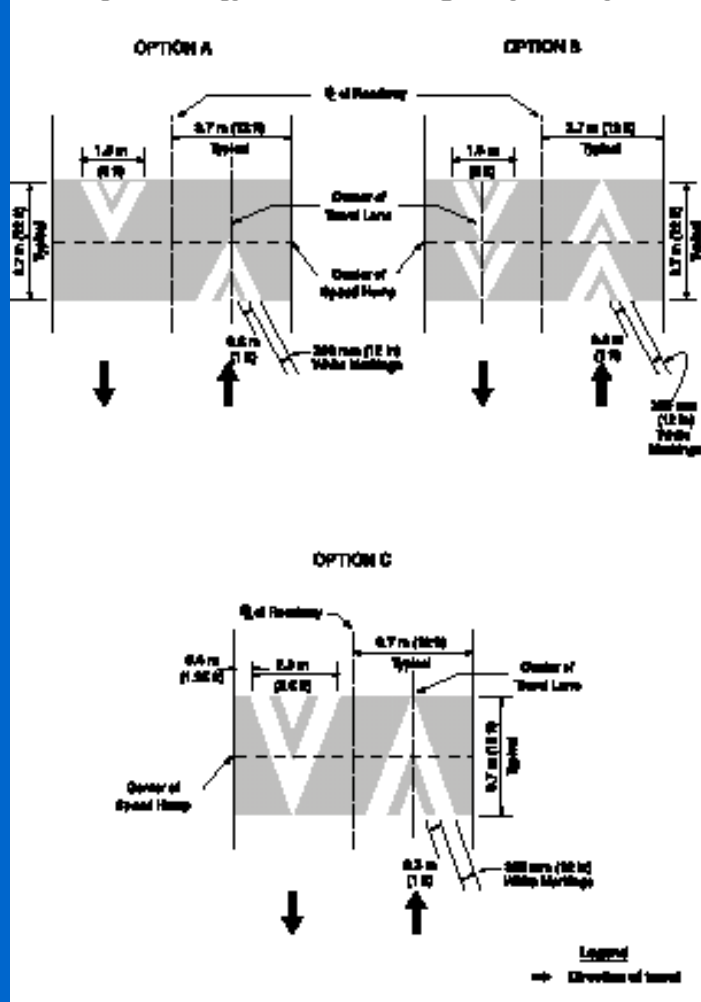
## 22' Speed Table



Source: Bureau of Traffic Management, "Traffic Manual" Portland, OR, December 1994, Chapter 11

# Speed Hump Markings

Figure 520-26. Typical Pavement Markings for Speed Humps



# ITE Speed Hump Guidelines

- Streets classified as “local”
- No more than 2 travel lanes or 40 foot pavement width
- Horizontal curve of 300 foot radius or more
- Vertical curve with adequate stopping sight distance
- Grade of 8 percent or less
- Posted speed limit of 30 mph or less
- No more than 5 percent long wheel-base vehicles
- Not on primary emergency response route or bus route
- Majority of residents support

# Traffic Circle

## Description:

- Traffic circles are raised circular medians in an intersection. Vehicles must change their travel path to maneuver around the circle and are typically controlled by “Yield on Entry” on all approaches

## Advantages:

- Slows traffic as it drives around circle
- Breaks up sight-lines on straight streets
- Opportunity for landscaping in the intersection

## Disadvantages:

- May impede emergency response
- May impede left turns by large vehicles
- On streets with bicycle facilities, bikes must merge with traffic around circle
- May shift traffic to parallel residential streets
- May require some parking removal

## Special Considerations:

- Need to be used in series or in conjunction with other traffic calming devices
- Should not be used on critical emergency response routes
- May require extensive signing
- **May require educational campaign and learning period**

## Cost:

- Moderate to High

## Where to Apply:

- *Streets where speed control is desired*

# Restricted Movement Barrier

## Description:

- Barrier island that prevents certain movements at an intersection

## Advantages:

- Redirects traffic to main streets
- Self enforcing, unlike signage only
- **Reduces cut-through traffic**
- Increases opportunity for landscaping in the roadway

## Disadvantages:

- May negatively affect emergency response
- May increase trip length for some drivers
- **May redirect traffic to parallel residential streets**

## Special Considerations:

- Should not be used on critical emergency response routes
- Has little or no affect on speeds for through vehicles

## Cost:

- Moderate

## Where to Apply:

- *Streets where reducing cut-through traffic is desired*



# Entrance Barrier – Half Closure

## Description:

- Physical barrier that restricts turns into a street. Creates a one-way segment at the intersection while maintaining two-way traffic for the rest of the block

## Advantages:

- **Effectively restricts movements into a street** while maintaining full access and movement within the street for residents

## Disadvantages:

- **May redirect traffic to other local streets**
- May increase trip length for some drivers
- In effect at all times; even if cut-through problem exists only at certain times of day

## Special Considerations:

- Should not be used on critical emergency routes
- Has little or no effect on speeds for local traffic
- Need to consider how residents will gain access to street

## Cost:

- Moderate to high

## Where to Apply:

- *Local streets where cut-through traffic is a concern*



# Diagonal Diverter

## Description:

- Raised areas placed diagonally across a four-way intersection that restrict through movements in all directions.

## Advantages:

- **Reduces cut-through traffic**
- Self enforcing, unlike signage only

## Disadvantages:

- **May redirect traffic to other local streets**
- May increase trip length for some drivers
- In effect at all times-even if cut-through problem exists only at certain times of day

## Variations:

- Traversable diverters that allow access for emergency response vehicles

## Special Considerations:

- Should not be used on critical emergency response routes
- Need to consider how residents will gain access to street
- Has little or no effect on speeds for local traffic

## Cost:

- Moderate to high

## Where to Apply:

- *Local streets where cut-through traffic is a problem*

# Street Closure

## Description:

- Full closure of a street

## Advantages:

- Restricts all through traffic
- Self enforcing

## Disadvantages:

- Will likely redirect traffic to other local streets
- Increases trip length for some drivers
- Increases emergency response times
- Legal issues regarding closing public roadway must be considered



## Special Considerations:

- Should not be used on critical emergency response routes
- Consider impacts to adjacent streets
- Consider emergency response requirements

## Cost:

- Moderate to high

## Where to Apply:

- *Local streets where cut-through traffic is the major concern*

# Other Tools

- Diagonal Parking
- No Through Access
- Chicanes
- Special Signs

# Other Tools

- Traffic Safety Campaigns
  - Newsletters
  - Brochures
  - Community Meetings
  - Web sites
- School Area Education

# Advantages and Disadvantages

# Summary of Potential Advantages

- Reduction in speeds
- Reduction in cut-through traffic
- Increase motorist awareness
- Create neighborhood identity
- Assist pedestrians
- Redirect traffic to main streets
- Can address time-of-day problems
- Opportunity for more landscaping/beautification

## Volume Impacts of Traffic Calming Measures

Measure	Sample Size	Ave. Change in Volume	Ave. % Change
Full Closures	19	-671	-44
Half Closures	53	-1611	-42
Diagonal Diverters	27	-501	-35
Other Volume Controls	10	-1167	-31

Source: ITE, Traffic Calming, State of the Practice



## Speed Benefits of Traffic Calming Measures

Measure	Sample Size	85 <sup>th</sup> Percentile Speed Afterward	Ave. Change in 85 <sup>th</sup> Percentile Speed	Ave. % Change
12' Humps	179	27.4 mph	-7.6 mph	-22%
22' Tables	58	30.1 mph	-6.6	-18
Longer Tables	10	31.6 mph	-3.2	-9
Raised Intersections	3	34.3 mph	-0.3	-1
Circles	45	30.2 mph	-3.9	-11
Narrowings	7	32.3 mph	-2.6	-4
Half Closures	16	26.3 mph	-6.0	-19
Diagonal Diverters	7	27.9 mph	-1	0

Source: ITE, Traffic Calming, State of the Practice

# Safety Benefits of Traffic Calming

- Limited Before/After Studies Available
- Collisions Have Decreased
- Are collision locations shifted?
- Obstacles may be struck

➤ **Streets are Perceived as Safer:**  
– Is this always good?

# Summary of Potential Disadvantages

- Affects emergency response
- Redirection of traffic to other residential streets
- Impacts persons who live on the 'calmed' street
- Increase in trip lengths
- Cost – may be expensive to build and maintain
- Can affect bicycle travel
- Noise issues
- Drainage issues
- May lose parking
- Compliance issues
- Aesthetics

# Emergency Response Issues

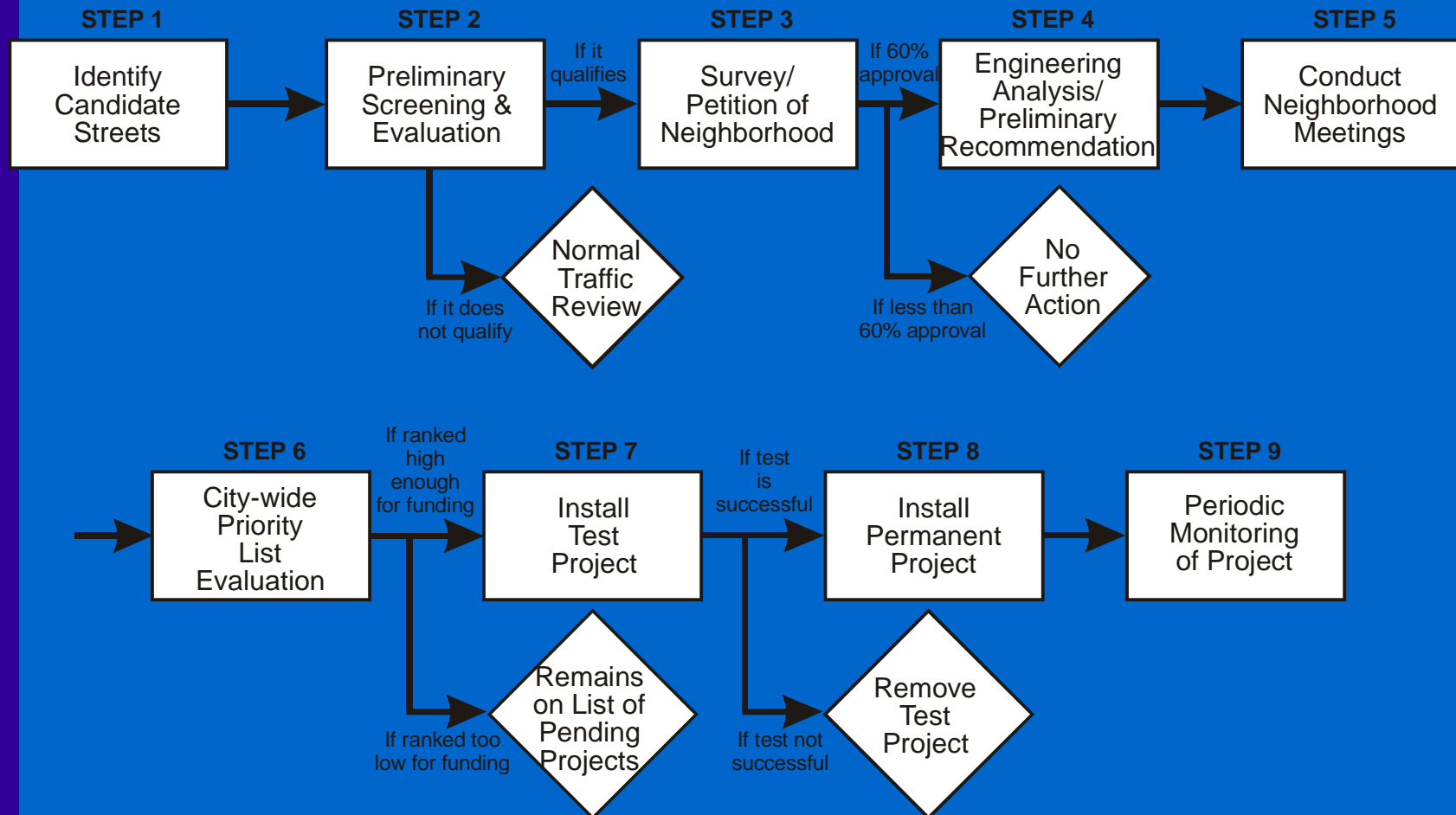
- Fire Departments very concerned:
  - Slows Response Times
  - Equipment Damage
  - Trauma to Patients

## **Strategies that have been used to Address Fire-Rescue's Concerns**

- Avoidance of Emergency Response Routes
- Avoidance of Emergency Response Facilities
- Gradual Escalation of Traffic Calming Measures
- Communication
- Use of Measures that Accommodate Fire-Rescue Vehicles
- Redesign of Traffic Calming Measures
- Traffic Calming Innovations
- Appeal for Citizen Support

# Processes and Programs

# Sample Neighborhood Traffic Control Program



# Sample Tool Box Guidelines

TRAFFIC CONTROL MEASURE	PROBLEMS TARGETED	STREET TYPE	CRITERIA				
			VOLUME (1)	SPEED	DIVERSION TO ADJACENT STREETS	GRADE	OTHER CONSIDERATIONS
<b>Speed Humps</b>	High Speeds, Cut-through Traffic	Local/ Collector	from 1,500 to 5,000 ADT on local streets, from 3,000 to 5,000 on collector streets (2)	85th % speed is greater than 30 MPH (2)	Acceptable Diversion Based on Diversion Curve	less than 10%	Street must have only one lane for moving traffic in each direction
<b>Diverters</b>	High Cut-through Traffic	Local	greater than 2,500 ADT	N/A	Acceptable Diversion Based on Diversion Curve	N/A	If full diverter, cannot be truck or transit route, emergency access to be considered
<b>Traffic Circles</b>	High Speeds, Accident History, Geometric Design Problems	Local/ Collector	from 1,000 to 5,000 ADT	N/A	Acceptable Diversion Based on Diversion Curve	less than 10%	Intersecting roadways must be of sufficient width. Loss of parking must be assessed. Cost of landscaping must be considered
<b>Chokers</b>	High Speeds, Cut-through Traffic	Local	from 1,000 to 5,000 ADT	N/A	N/A	less than 10%	Loss of parking must be assessed. Cost of landscaping must be considered
<b>Cul-de-sac</b>	High Cut-through Traffic	Local	ADT greater than 2,000 with 20% non-local	N/A	Acceptable Diversion Based on Diversion Curve	N/A	Cannot be truck or transit route, emergency access to be considered

Notes: 1) all volumes criteria based on average daily traffic. Refer to calendar of acceptable count days prior to taking counts

2) criteria is also met if 80% of both ADT and speed thresholds are met

General Notes:

- final determination of control application based on review by City Public Works Director
- subject to modification by City Council on a case-by-case basis
- N/A - criteria does not apply to specific control measure



# Other Types of Programs

- Public Awareness Campaign: Sacramento's Neighborhood Traffic Management Program
- Santa Monica's Residential Traffic Management Handbook

Questions/Comments?